Abstract:

IceCube is a cubic kilometer scale, deep-ice Cherenkov neutrino detector at the South Pole. As a large, three-dimensional neutrino detector, IceCube is a target-rich experiment; it has capability to measure atmospheric and astrophysical neutrinos in an energy region all the way from below TeV to EeV and higher to pursue the primary goal of neutrino astronomy. Furthermore, to study neutrino properties, the more densely instrumented DeepCore subarray increases IceCube's sensitivity at neutrino energies down to 10 GeV. In this talk I will summarize the selected recent highlights of IceCube in the field of high-energy astrophysics and particle physics. In particular, I will present IceCube's studies on diffusive astrophysical neutrino emissions and point-like neutrino sources with the world's best sensitivity. The results from the neutrino oscillation studies and constraints on the high energy neutrino-Nucleon cross-sections are also presented. Finally the future prospects towards the IceCube-Gen2 project will be discussed.